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ABSTRACT

The Tech Prep Associate Degree (TPAD) program must be clearly focused on technician-level occupations, which are expected to have the greatest occupational growth. Generally, the preparation required to enter the work force at the technician level is completion of an associate degree program that includes 50 percent theory and 50 percent applied vocational-technical or related instruction. In most instances, use of technology in the workplace dictates the preparation needed to perform the role of a technician. According to the literature on "high tech," service industries lack the glamour of high tech, but technology innovations have changed the skill requirements of workers; technology extends human capabilities, is applied human knowledge, is application based, and exists in both physical and social domains. The emphasis on integrating academic and vocational-technical education could not have come at a better time. "Doing" and "thinking" must be combined if the TPAD program is to prepare technicians successfully for the workplace. Research shows that entry-level electronics technicians are expected to have both academic and vocational-technical skills. Seven TPAD pilot projects underway in West Virginia should reveal how the public school and higher education systems can work cooperatively to serve students and the state. Educators, business, government, and parents must work cooperatively to carry out the TPAD work force preparation program. (YLB)

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WORK FORCE PREPARATION FOR TECHNICIAN-LEVEL OCCUPATIONS*

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The Tech Prep Associate Degree (TPAD) initiative may be the most comprehensive and exciting effort underway for transforming the vision of public education and preparing a world-class work force in the state. It is becoming increasingly clear that today's educational system must expect all students to learn at a high level, not just those students who are destined to pursue a baccalaureate degree and professional occupation. Learning must become a new form of labor because job security is based on job skills. Linking education and economic development is essential for increasing the standard of living for all West Virginians.

Most studies reveal that by the end of the decade 60 percent to 80 percent of the occupations will require educational attainment beyond high school but less than the bachelor's degree. Technician-level occupations are expected to have the greatest occupational growth. These type occupations hold the most promise for revitalizing the state's economy, while raising the economic prosperity and standard of living of its citizens.

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* Summary of a presentation by Dr. Harmon at the 17th Technical & Adult Education Conference on August 6, 1992 in Charleston, West Virginia.

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The TPAD program must be clearly focused on technician-level occupations. The ideal program would prepare the program completer for immediate entry into a technician-level occupation and serve as a foundation for additional study toward an appropriate bachelor's degree. Of primary importance, however, is that the TPAD program offer the academic (minds-on) and vocational-technical (hands-on) skills needed to perform the role of a technician.

Several terms are mentioned in the literature to describe occupations requiring educational preparation beyond high school but less than a bachelor's degree. These include technician, middle-level, mid-management level, paraprofessional, and semi-professional. The most common characteristics of these occupations are:

- Training beyond high school
- Having theoretical knowledge equal to one or two years of a professional program
- Training in manipulative skills
- Understanding of human behavior
- Training as assistants to professional workers or administrative officials

Generally, the preparation required to enter the workforce at the technician-level is completion of an associate degree program that includes 50 percent theory and 50 percent applied vocational-technical or related instruction. Technicians must be able to apply the theoretical concepts and principles of science and other disciplines in the workplace. In most instances, it is the use of technology in the workplace that dictates the

preparation needed to perform the role of a technician, paraprofessional or similar term. The label "high-tech" is sometimes misleading to those who seek to plan programs that prepare technician-level workers. Some conclusions can be drawn from the literature on this issue:

1. Service industries lack the glamour of "high tech," but technology innovations have changed the skill requirements of workers. Operators and assemblers are declining.
2. Service technicians at various points in a career are usually required to market and sell products in addition to the installation, testing, and maintenance of the products.

3. Technology extends human capabilities. It enables humans to adapt to and change the physical world.

4. Technology is applied human knowledge. Because technology uses information from all domains, it is more than applied science.

5. Technology is application-based. It is more than knowledge because it involves a combination of knowledge, thinking skills and physical processes (i.e., knowing, thinking, doing).

6. Technology exists in social domains as well as physical domains. It can be both "hard" (e.g., tools, equipment) and "soft" (e.g., management systems, software).

What is lacking now is the link between the pure research and the commercialization of new products. A major roadblock to the commercialization process is the shortage of trained technicians. The major problem is not the availability of high-tech equipment, but the relatively poor application of the new technologies in the development and production of new products and services.

Technical skills and scientific knowledge are much more closely related to equipment used on the job and to the style of management than to the technology used in the product. In addition, new management philosophies are replacing the hierarchical, authoritarian scientific management concepts known as "Taylorism." Work in the new environment is multiskilled and performed by teamwork -- "doing" and "thinking" are combined.

The emphasis on integrating academic and vocational-technical education could not have come at a better time. "Doing" (hands-on) and "thinking" (minds-on) must be combined if the TPAD program is to successfully prepare technicians for the workplace. Therefore, traditional high school vocational programs intended to prepare persons to perform repetitive tasks in the workplace, and community college programs intended to prepare persons for transfer to a theory-oriented bachelor's degree program, may not be appropriate for preparing technician-level workers.

What competencies are required for an entry-level electronics technician? In 1983 the American Association of Community and Junior Colleges and the Electronic Industries Association co-sponsored a study to answer this

question. Twenty-three community colleges across the U.S. surveyed 353 industries, of which 293 responded.

Table 1 shows the results of the study. Clearly, the technician is expected to have both academic and vocational-technical skills. The study also revealed that different size businesses may interpret "basic skills" differently. Large businesses with the capability to train workers in technical skills, usually interpreted basic skills as basic "academic" skills. Small businesses, who usually have little capability to train workers, interpreted basic skills to include both the academic and vocational-technical skills to perform the technician's job. Over 90 percent of the businesses in West Virginia are small businesses.

The seven TPAD pilot projects underway in the state promise to reveal how both the public school and higher education system can work cooperatively in better serving their students and the state. The 19 county school systems, seven colleges, and the state Vocational Rehabilitation Center involved in the pilot projects have an opportunity to demonstrate how education can play a critical and necessary role in revitalizing the state's economy.

Over 21,000 openings in technician-level occupations are projected by the year 2000 in West Virginia (see Table 2). It is also likely that many additional businesses that currently exist in the state will need higher ability workers to successfully compete in a global economy. Employers seeking to locate a business in the state will expect a workforce with higher level skills.

Educators, business people, labor organizations, government, parents and others must work cooperatively to prepare the state's future work force. Technician-level occupations and the TPAD work force preparation program deserve strong support by those who seek to advocate higher expectations for the "neglected majority" of students in the public schools and a higher standard of living for West Virginians.

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TABLE I

Competencies Required of Entry Level Technician

Skill	Number Mentioning	Percent of Respondents Mentioning Item
Basic Electronics	98	33.4
Mathematical Competence	71	24.2
Schematic/Blueprints	70	23.9
Test Equipment	56	19.1
Communication Skills	55	18.8
Work Experience	55	18.8
Circuits	43	14.7
Troubleshooting	43	14.7
Digital Electronic	32	10.9
Analog System	22	7.5
Wiring/Soldering/Welding	20	6.8
Manual Dexterity	20	6.8
Analytical Ability	18	6.1
Instrumentation	18	6.1
Measuring/Calibration	16	6.1

TABLE II

West Virginia Occupational Projections

Occupation	Projected Year 2000	Average Annual Openings
Engineering Technicians	5,824	268
Electrical & Electronic Technicians	1,296	87
Other Engineering Technicians	3,040	28
Physical & Life Science Technicians	2,279	191
Social Service Technicians	814	96
Legal Assistance & Technicians	974	168
Library Technical Assistants	460	65
Emergency Medical Technicians	934	52
Dietetic Technicians	105	9
Dental Hygienists	631	38
Medical & Clinic Lab Technicians	1,752	97
Medical Records Technicians	583	45
Nuclear Medicine Technicians	103	5
Radiologic Technicians	1,389	98
Electroencephalograph Technicians	142	8
Electrocardiograph Technicians	135	7
Surgical Technicians	388	24
Broadcast Technicians	202	27
All Other Technicians	193	23
	21,244	1,336

Source: WV Bureau of Employment Programs, December 1990